Building Research Establishment Digest

CI/SfB Yi

DIGEST 156

August 1973

Specifying timber

Some of the time-honoured clauses in building specifications, requiring for example timber to be 'free from all defects', are quite unrealistic and could only be satisfied by small laboratory specimens. To specify a higher quality of material or workmanship than is necessary for a specific purpose, or a lower moisture content, will serve merely to increase the cost.

This digest offers guidance in the preparation of concise and unambiguous specifications for timber, both for materials and workmanship, and in the proper use of references to British Standards and Codes of Practice.

Much poor work and low quality in building is the fault of the specifier. Most contractors and manufacturers would rather do a good job than a poor one —but if they are not told precisely what is required, the results are not likely to satisfy.

It is important to specify only what can reasonably be obtained or performed and what one is prepared to insist upon. Anything else is valueless padding and detracts from the credibility of the specification. Specifications require clear, concise wording, avoiding jargon and phrases such as 'in accordance with the best practices of the trade'. The object is to tell the contractor or manufacturer what material to use, the way components are to be made and finished, and where, when and how they are to be fixed. For many jobs, the specification can be quite brief.

Many specifications dealing with wood or wood-based products contain references '. . . to BS . . .', without citing the date, the relevant parts of the Standard, or even ensuring that it is appropriate. Do not quote a British Standard without first ascertaining that:

it is current and amended up to date

it is relevant

any alternatives are acceptable or the selected alternative is specified.

The National Building Specification 1973 offers a satisfactory framework on which a concise and unambiguous specification, specific to the proposed project, can be built.

The form and content of a specification

The following five clauses may be considered as 'Notes for Guidance'.

Foreword Only justified for very large contracts, this could give background information and mention any special features.

Scope Set out the extent of the work, mentioning special requirements and exceptions.

Definitions To avoid misunderstandings, define the terms used in the specification, using the BS glossaries such as BS 881, 589:1955 *Nomenclature of commercial timbers* and BS 565:1963 *Glossary of terms applicable to timber and woodwork.* Set out the meaning of any symbols and abbreviations used in the text or on drawings.

Authorities Draw attention to any statutory instruments or regulations that must be observed. This is an appropriate place for a schedule of Standards referred to in the specification and for a schedule of the drawings.

Conditions of use, installation, manufacture or storage State the relevant environmental features, eg whether the site is exposed, whether the building is heated or air-conditioned and in what way, and the expected range of temperatures and humidities. This is important as influencing the moisture content of the material and the degree of protection required. The use to which the building is to be put, and whether the use is regular or intermittent needs to be stated. A note is required on the relationship between components and the structure, drawing special attention to the standards of accuracy demanded and the allowable tolerances.

Quality of timber

Timber in the quantities and sizes required in building cannot be 'free from all defects'. The specification should define an acceptable quality for the job. This is not easy, though the adoption of performance standards and the requirement of test certificates, samples or patterns may assist. The citation of a British Standard or Code of Practice may be sufficient,

though standards refer to generally acceptable standards of quality and often permit alternative materials and methods. It needs to be made clear which of the variations are acceptable, eg 'doors to BS 459 Pt 1 : 1954' will be satisfied by the use of mortice and tenon joints *or* dowelled joints.

Commercial qualities or stress grades acceptable for the work should be specified, or a performance requirement stated. Grading systems allow various levels of defect in the grades and it is uneconomic to demand a higher grade than is needed. It is seldom necessary to specify in detail the species and grades to be used; the consequent restriction of choice may result in increased cost without corresponding advantage. A common error has been to require carpentry timber to comply with BS 1860; the current edition does NOT establish grades; it sets out methods of measuring those defects which affect strength.

For most contracts the following clauses could be used:

Timber for carpentry shall be (name of species or group number—probably S2—from CP 112 Part 2: 1971) and of the following grades in accordance with CP 112 Part 2:1971:

50 Grade—floor beams, trimmers, lintel beams, purlins, hangers, posts, struts, principal rafters and other members in trusses spaced over 600 mm apart, and load-bearing hips and valleys.
Composite Grade—(at least 75 per cent of members are 50 grade and better)—floor joists, ceiling joists, common rafters and trussed rafters, all at not more than 600 mm centres; floor boarding (if strength is the sole consideration)
40 Grade—studs, plates, roof boards, sheathing boards and tiling battens.
4th or 5ths (*Scandinavian*) or equivalent—for non-loadbearing items such as noggings, grounds and packings.

(A revision of BS 1860 is shortly expected which will establish grades for various structural uses differing from the above in certain respects.)

Timber for joinery to be (names of species) and conforming to the requirements of (Class 1S, 1, 2 or 3) in BS 1186 Part 1:1971 except as may be modified by the succeeding clauses of this specification.

Consultation between the parties is necessary to ensure that the stipulations are understood and to discover any adjustments necessary in the interests of economy and efficiency.

Moisture content

Moisture content is expressed as a percentage of the dry weight, though in practice it is usually measured with an electrical moisture meter. The specification should state the moisture content of the timber *at the time of building in* and should also state the permissible deviation. This should not be too fine; ± 2 per cent is a suitable allowance for most purposes and is likely to be within the limits of accuracy of measurement by meter. Timber can be air-dried in this country down to about 17–23 per cent, depending on the climatic conditions that prevail at the end of the drying period; lower moisture contents can be attained only by kiln-drying, which adds to the cost.

At the time of incorporation in the building, timber should be at a moisture content appropriate to its use; this should not be much higher than the equilibrium moisture content that it will eventually attain in service. For structural timbers, this will usually be between 15 and 18 per cent. CP 112 tabulates different basic stresses, working stresses and moduli of elasticity for 'dry' timber (not exceeding 18 per cent moisture content) and 'green' timber (likely to remain above 18 per cent after construction); a *maximum* moisture content of 22 per cent, at the time of building in, should be specified for the latter.

The dryness attained by internal joinery is influenced greatly by the standard of heating. The guidance offered in Codes and Standards calls for a wide variety of moisture requirements, some of which are rather finely graduated. More realistic commercial possibilities are set out in Table 1.

Table 1 Suggested specifications of moisture content

Use	Moisture content at time of building in per cent	
Carpentry	18	±2%
External joinery Internal joinery with intermittent heating Industrialised components	15	
Interior joinery with constant central heating	12	
Interior joinery in close proximity to a heat source, including flooring over embedded heating	9	
Structural timber 'green' (CP 112)	22 maximum	

Preservative treatment

Before specifying a preservative treatment it is necessary to decide whether the severity of the service environment is such that it merits protection against decay or insect attack. For some purposes this decision is taken in the form of mandatory requirements, such as Building Regulations, or through specifications drawn up by major users. In other cases the decision rests with the architect or designer, who must either take expert advice, or consult the relevant BS Code of Practice. Unfortunately one of the most

important of these, CP 98:1964 *Preservative Treatment for Constructional Timber,* is out of date, and does not give specific advice on the need for treatment, but it is currently under revision. CP 153: Part 2:1970 *Windows and Rooflights—Durability and Maintenance* gives advice on the need to treat wooden windows.

The Building Regulations 1972 which apply in England and Wales require the treatment of softwoods used in roof construction in certain named areas of the country. They also require the treatment of timber used as fillets in concrete, and of timber cladding when constructed from certain less durable wood species. In Scotland separate Building Standards apply and a pressure process is specified for softwood cladding (other than western red cedar).

Several local authorities have specific preservation requirements and many like the Greater London Council require the treatment of external softwood joinery. There is a compelling case for the treatment of external joinery and in the private sector it is required by the National House Builders' Registration Council, unless the joinery is constructed from named, more durable, timber species. Many government departments and public authorities have preservation requirements for timber used in their own contracts (eg Department of the Environment—Timber used in Motorway Fencing; Timber in Construction; CEGB—Timber used in Cooling Towers) and the Ministry of Agriculture, Fisheries and Food makes preservative treatment a requirement for certain farm and horticultural improvements which qualify for a grant in aid.

Whilst some authorities have written their own specifications others refer to those produced by the British Standards Institution and by the British Wood Preserving Association (a trade organisation). A list of the main specifications and codes on wood preservation produced by these two organisations is given below.

BS 1282:1959	Classification of Wood Preservatives and their Methods of Application *under revision*
BS 144:1954	Coal Tar Creosote for the Preservation of Timber *under revision*
BS 3051:1972	Coal Tar Creosotes for Wood Preservation (other than creosotes to BS 144)
BS 913:1954	Pressure Creosoting of Timber *under revision*
BS 4072:1966	Wood Preservation by means of Water-borne Copper/chrome/arsenic Compositions *under revision*
BS 3842:1965	Treatment of Plywood with Preservatives
BS 4079:1966	Plywood made for Marine Use and Treated against attack by fungi, insects and marine borers
CP 98:1964	Preservative Treatments for Constructional Timber *under revision*
CP 153: Part 2:1970	Windows and Rooflights—Durability and Maintenance
BWPA 104	Pentachlorophenol-based Wood Preserving Solutions and their Application by Non-pressure Methods
BWPA 105	The Preservation of Softwood Timbers by means of 'Timbor' (disodium octaborate tetrahydrate)
BWPA 106	Copper Naphthenate-based Solutions for Wood Preservation and their Application.

The above specifications do not deal adequately with the wide range of preservatives classified as organic solvent preservatives, particularly in relation to their use for protecting external joinery. For this reason a specification has been drawn up in PRL Technical Note No. 24—Preservative Treatments for External Softwood Joinery Timber, which defines preservative requirements for painted external joinery, and lists formulations which meet these requirements.

Preservative treatments do not all give the same level of protection, and each type possesses certain features which make it more suited for some purposes than others. For conditions of severe external exposure (eg timber in the ground) a pressure process (eg BS 913 or BS 4072) should be employed, whilst for less hazardous situations lighter forms of treatment such as immersion may be sufficient. Creosote on account of its smell and oily nature tends to be used away from inhabited buildings. Copper/chrome/arsenic preservatives are perhaps the most versatile but being water borne they leave the timber wet and incur a requirement to re-dry for most purposes, with the risk of some distortion. Organic solvent preservatives are relatively quick drying and do not cause any timber movement, but the methods of application generally employed (brushing, deluging and immersion) provide only limited penetration. Improved penetration of OS preservatives is provided by the Double Vacuum Process which, although originally designed for joinery treatment, is now being used more widely for other building timbers. Except for the boron diffusion process (BWPA 105), it is important that the timber should be adequately dried before treatment. Diffusion treatment, on the other hand, must be carried out on green timber at source. It is thus purchased already treated, but its use is restricted to situations where leaching with water is not a hazard.

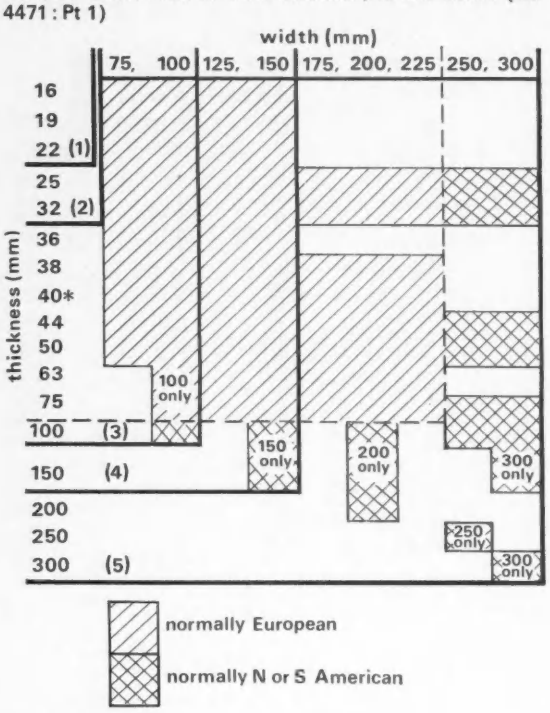
At present the loading or treatment requirements for various end uses are contained in the preservative specification, but future trends are towards commodity specifications which would bring together under one cover all preservative processes which are suitable for each commodity.

Sizes and allowances for processing

BS 4471 Part 1:1969, from which Table 2 is derived, gives a range of basic sizes of commercially available sawn softwood, measured at 20 per cent moisture content. The permissible deviations from these basic sizes, allowed by the Standard, are:

on dimensions not exceeding 100 mm: −1, +3 mm
on dimensions exceeding 100 mm: −2, +6 mm

Table 2 Basic sizes of sawn softwood, in millimetres (BS 4471 : Pt 1)



* Check availability before specifying

Numbers in brackets refer to finished sizes in Table 3

When smaller sizes are produced by resawing, no more than 2 mm reduction in the size of each piece is permitted.

For precision timber, regularised by machining at least one face and one edge, the specification should state the basic size but the finished size will be 1 mm less.

For various end-uses, the following reductions from basic sizes to finished sizes are suggested, with a permissible deviation of ±0·5 mm:

Table 3 Finished sizes for various end-uses

	Reduction (in mm) from basic sizes of Table 2				
	(1)	(2)	(3)	(4)	(5)
Constructional timber, surfaced	3	3	3	5	6
*Floorings	3	4	4	6	6
*Matchings and interlocking boards, Planed all round	4	4	4	6	6
Trim	5	5	7	7	9
Joinery and cabinet work	7	7	9	11	13

*Excluding reduction of face width by tongue or lapped joint.

Numbers in brackets refer to size groups of Table 2.

Quality of workmanship

This is difficult to define, hence phrases such as 'in a workmanlike manner' and 'to the architect's satisfaction', which depend upon the judgment of individuals representing the architect, tend to be used. For timber components it will often be sufficient to state:

> The quality of workmanship is to be not less than that set out in BS 1186:Pt 2:1971 and the succeeding clauses of this specification dealing with components.

BS 1186:Part 2 permits laminating, finger-jointing and edge-jointing in the interests of economy and a more stable product. The proper use of these techniques can result in a better product at less cost.

For many jobs it may be necessary, or at least useful, to amplify this clause by setting out the required characteristics and performance of some components.

Reliability

It is useful to include a clause covering liability for unsatisfactory performance during a maintenance or retention period. Component manufacturers are often held responsible for defects arising after delivery in circumstances over which they have had no control. A clause calling for a check of moisture content at the time of delivery and at the time of acceptance is fair to all parties and will help to place the responsibility for any later defects upon those who can and should control the circumstances.

Quality control

Approval and periodic checking of jigs used in production are necessary. The manufacturer should be required to carry out agreed quality control procedures and to allow access for checks of moisture content and quality.

Procedure

State the order in which work is to be done or components delivered to site, *precise* requirements for storage at the factory and on site, protection during transit and arrangements for making good. It is insufficient to state 'components to be adequately stored' or similar wording.

Specifications impose a discipline upon both buyer and seller. Just as a law that is not enforceable is a bad law, so an unrealistic or loose specification is a bad one.

Department of the Environment **Building Research Establishment**

Prepared at Princes Risborough Laboratory, Princes Risborough, Aylesbury, Buckinghamshire. © *Crown copyright 1973*

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Published by Her Majesty's Stationery Office and printed in England by Benham and Company Limited, Colchester.

Single copies 5p each. Annual subscription inclusive of postage £1·20 to cover 18 issues.

Quantity rates (excluding postage) for bulk supply of any one Digest: 25 for £1·05, 50 for £1·65, 100 for £3.

Dmd. 505866 K704 SBN 11 721599 6